CHAPTER 2

Existing Conditions in the HCP Area

2.1 Location and Regional Setting

Imperial Irrigation District (IID) is located in the Imperial Valley in the southeast corner of California, east of Los Angeles and San Diego. Imperial Valley lies within the Salton Trough (Cahuilla Basin), an area of very flat terrain. The Salton Trough encompasses a large portion of the Colorado Desert (a subdivision of the Sonoran Desert, extending through portions of Mexico and Southern Arizona) with much of the area below sea level.

2.2 Physical Environment

2.2.1 Climate

The Imperial Valley is one of the most arid regions in the United States. The climate of the Habitat Conservation Plan (HCP) area is that typical of desert regions, with hot, dry summers and high winds, with occasional thunderstorms and sandstorms. Summer air temperatures typically are above 100° Fahrenheit (F) and can reach 120°F. Winter temperatures generally are mild, usually averaging above 40°F, but frost may occur occasionally.

The prevailing winds in Imperial Valley are from the west. Average wind speeds range from 4 to 7 miles per hour. However, at the Salton Sea, the winds are predominantly from the east in the northern portions of the sea, while in the southern portions of the sea, westerly winds predominate similar to the rest of the Imperial Valley.

The rain fall can occur from November through March, but because the area is in the rainshadow of the Peninsular Ranges, it receives little precipitation. The 85-year average annual rainfall is 2.93 inches. June is the driest month; precipitation in June has only occurred three times during the period of record. Precipitation in the form of snowfall was recorded only once.

2.2.2 Topography

The Salton Trough is a basin and the most dominant landform in Imperial County. Approximately 130 miles long and 70 miles wide, the Salton Trough is a seismically active rift valley, and encompasses the Imperial Valley, the Mexicali Valley, and the Gulf of California in Mexico in the south and the Coachella Valley in the north (Reclamation and SSA 2000). The Salton Sea is in the northern portion of the Salton Trough.

As discussed above, the basin topography is relatively flat with little topographic relief. The Sand Hills are an area of windblown sand deposits that form a 40-mile-long by 5-mile-wide belt of sand dunes extending along the east side of the Coachella Canal from the Mexican border northward. Within the Coachella and Imperial Valleys, an old lake shoreline (Lake Cahuilla) has been identified by the presence of lacustrine deposits. The Imperial Formation, which is marine in origin, underlies the sequence of sedimentary layers within the basin. The Imperial Formation is underlain by igneous and metamorphic basement rocks (Reclamation and SSA 2000).

In the dry climate of Imperial County, the soils of Imperial County, unless they are irrigated, have no potential for farming (County of Imperial 1997). Lacustrine basin soils in the Imperial Valley formed on nearly level old lake beds in the area of ancient Lake Cahuilla. These soils generally consist of silty clays, silty clay loams, and clay loams and are deep, highly calcareous, and usually contain gypsum and soluble salts. The central irrigated area served by the IID generally has fine-textured silts and is primarily used for cropland. Continued agricultural use of soils within IID required installation of subsurface tile drains to carry away water and salts that would otherwise build up in the soils and prevent crop growth. Tile drains discharge this flow to surface drains (IID 1994). Sandy soils, typical of the deserts in the southwest U.S., are predominant in higher elevations, such as the East and West Mesas, and generally are used for recreation and desert wildlife habitat. The irrigated portion of Imperial Valley generally is flat and has low levels of natural erosion.

The Imperial Valley is located within one of the most tectonically active regions in the United States, and therefore is subject to potentially destructive and devastating earthquakes. Additionally, the Imperial Valley is susceptible to other geologic hazards including liquefaction and flooding.

2.2.3 Hydrology and Water Quality of the Imperial Valley

Surface water within the Imperial Valley comes primarily from two sources: the Colorado River and inflow across the International Boundary from Mexico via the New River. Agricultural production served by IID is almost entirely dependent on surface water that is diverted from the Colorado River and into the IID distribution system. After application to farm fields for irrigation purposes, the water is collected in drains. The drains transport water directly to the Salton Sea or to the New or Alamo Rivers that discharge to the Salton Sea. With no outlet, the Salton Sea is a terminal sink for drain water from Imperial Valley.

2.2.3.1 Water Quality

Irrigation Delivery Water

The IID water distribution system begins at the Colorado River where water is diverted at the Imperial Dam and conveyed by gravity through the All American Canal (AAC). The AAC discharges water to three major distribution canals in the IID service area—the East Highline, Central Main, and Westside Main Canals. These three canals serve as the main arteries of a system consisting of approximately 1,667 miles of canals and laterals that distribute irrigation water within IID’s service area.

About 4.4 million acre-feet per year (MAFY) of water per year is diverted into the AAC at Imperial Dam. Of this total, flow measurements (collected from 1986 to 1999 at Drop No. 1, just before the AAC enters the IID Service Area) show that Colorado River irrigation deliveries generally range from approximately 2.4 MAFY to more than 3.2 MAFY. The average annual delivery of irrigation water during the same period is approximately 2.8 MAFY. The remaining balance of diverted water is discharged into the Yuma Main Canal, the Gila Gravity Main Canal, returned to the Colorado River for Mexico’s use via Pilot Knob, diverted into the Coachella Canal or is lost to spillage, evaporation or seepage.

Colorado River diversions account for approximately 90.5 percent of all water flowing through IID. The remaining water components flowing through IID include: flow from the New River across the International Boundary at approximately 5 percent, rainfall at approximately 4 percent, net groundwater discharge to the irrigation system of less than 1 percent, and flow from the Alamo River across the International Boundary at less than 0.1 percent.

The delivery of Colorado River water to IID is driven by user demand. This demand is not constant throughout the year, but varies because of a combination of influences such as changes in climate and local rainfall conditions, crop cycles, and government crop programs. Demand is typically highest in April and remains fairly high until August when it starts to decline.

Colorado River water imported by IID is either used consumptively, or is collected in surface drains or rivers. Consumptive use includes transpiration by crops and evaporation directly from soil or water surfaces. Approximately 66 percent of the water that is delivered for on-farm use is used for crop production and leaching and roughly 3 percent is lost to evaporation. The remaining water delivered for on-farm use discharges into the IID drainage system as surface runoff or is lost to shallow groundwater.

Drainage Water

The IID drainage system includes a network of surface and subsurface drains. Water entering the drainage system can originate from the following sources:

- Operational discharge (i.e., water that has traveled through portions of the IID water conveyance system and was not applied to land). The main components of operational discharge are canal seepage and canal and lateral spillage. Canal and lateral spillage refers to unused water that is discharged from the delivery system to the surface drains or river systems.
- On-farm tailwater runoff (i.e., surface water runoff occurring at the end of an irrigated field)
- On-farm leaching (i.e., water passing the crop root zone that normally enters a tile drain; also referred to as tilewater)
- Stormwater runoff
- Groundwater

Water collected by the tile drainage systems either flows by gravity or is pumped to surface drains, which discharge to the Salton Sea either directly or via the New and Alamo Rivers. With the exception of drainage water that is returned to the fields as irrigation water or flow lost to shallow and deep groundwater aquifers (through deep percolation that is not captured by the tile drains), all flow collected by the IID drainage system is ultimately conveyed to the Salton Sea.

Water applied to the fields in IID serves two purposes: to replenish moisture in the crop root zone and to leach accumulated salts from the soils. According to a recent study by IID, approximately 15 percent of the water applied to IID fields runs off as tailwater. Except in those fields with tailwater recovery systems, this water is no longer available for on-farm use and is discharged into either surface drains or rivers. Approximately 16 percent of irrigation water delivered to fields is used for the leaching of salts accumulated in the soils. This water percolates to the tile drainage system where it is collected and conveyed to the IID surface drains.

Collectively, tilewater and tailwater drainage accounts for roughly 67 percent (34 and 33 percent, respectively) of all of the IID drainage discharged to the Salton Sea either directly or via the New and Alamo Rivers. The Alamo River receives approximately 61 percent of the discharge from the IID drainage system, and the New River receives roughly 29 percent of the District's drainage. The remaining 10 percent is discharged from the drainage system directly to the Salton Sea. Total IID discharge to the Salton Sea has averaged about 1.16 MAFY during 1986 to 1999. Figure 2.2-1 shows the annual variability of IID's total surface discharge to the Salton Sea during 1986 to 1999.

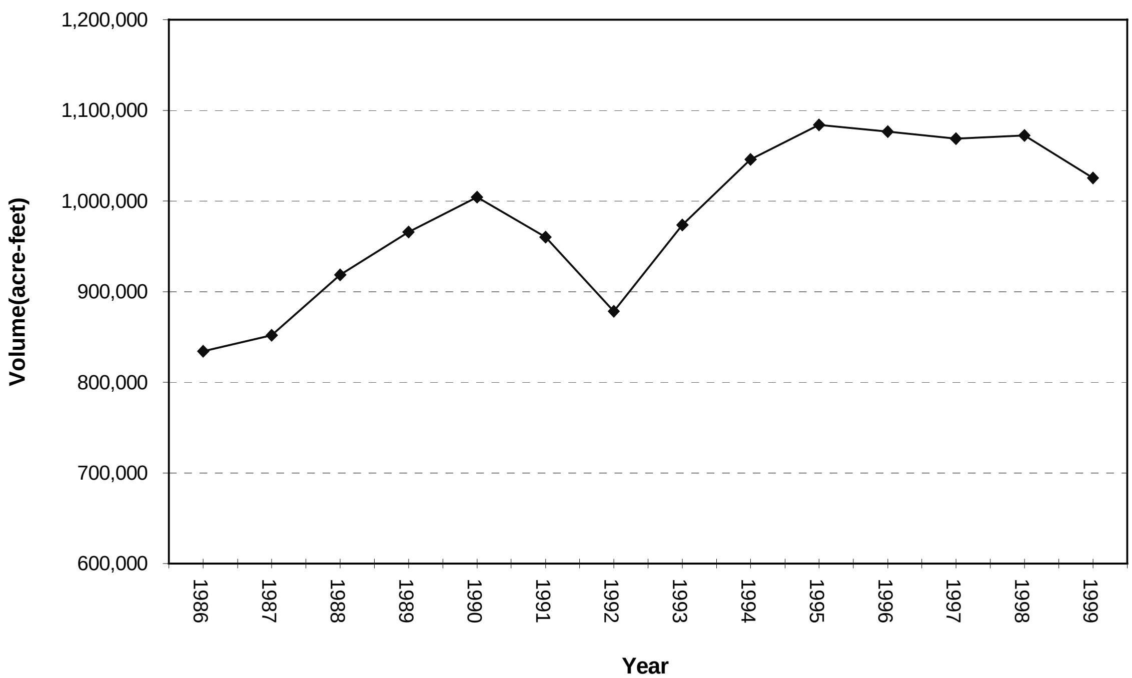

FIGURE 2.2-1
Total Farm Drainage from IID Discharging into the Salton Sea (1986-1999)

Alamo River

The Alamo River enters IID from Mexico. Currently, there is no flow in the Alamo River coming from Mexico across the International Boundary because of the installation of a dam at the boundary in 1996 by Mexico. However, the previous 5-year average annual flow volume at the US/Mexico border was less than 2 thousand acre-feet per year (KAFY). The Alamo River receives drainage from about 58 percent of the IID area and accounts for about 61 percent of IID's drainage discharge. Outflow from the Alamo River to the Salton Sea is estimated at about 605 KAFY, with about 168 KAF from rainfall; municipal, industrial, and operational discharge; and seepage, 211 KAF from tailwater, and 223 KAF from tilewater.

New River

The New River also enters IID from Mexico, but, unlike the Alamo, the New River serves as an open conduit for untreated municipal sewage, heavy metals, and agricultural drainage waters high in pesticide residues from northern Mexico. The average annual flow volume of the New River at the International Boundary during the period 1987 to 1998 was about 165 KAFY, which comprised approximately one-third of the total flow of the New River at its discharge to the Salton Sea. Therefore, the New River is a significant source of pollutant loading into the Salton Sea. Water demand and discharges in Mexico might affect annual flows, and flow volumes at the boundary have changed dramatically during the period of record. Gage data shows flow in the New River at an average annual low of 41 KAFY from the period 1950 to 1957, increasing to an average of 110 KAFY during the period 1958 to 1978. Flows across the boundary increased again to an annual average of 150 KAFY during the period 1979 to 1982, and then again from 1983 to 1988 to values higher than 250 KAFY. The discharge from Mexico leveled back to approximately 100 KAFY for the period 1987 to 1999.

The New River receives approximately 29 percent of the drainage from IID, and including input from Mexico, accounts for about 39 percent of the total discharge from the IID water service area to the Salton Sea. The average annual flow from the New River to the Salton Sea is made up of approximately 81 KAFY from rainfall, municipal and industrial effluent, IID operational discharge, and canal seepage; 102 KAFY from tailwater; and 108 KAFY from on-farm tile drainage, for a total of 291 KAFY, with the remainder of the flow coming from Mexico and net river losses.

2.2.3.2 Water Quality

Water quality in the HCP area is determined by the quality of water diverted from the Colorado River, the water quality of water in the New River as it crosses the International Boundary, and agricultural practices. The following sections summarize water quality information for:

- Irrigation delivery water
- Drainage water
- Alamo River water
- New River water

Additional information on water quality conditions in the HCP area is provided in Section 3.2 of the environmental impact report/environmental impact statement (EIR/EIS).

Table 2.2-1 summarizes water quality data for irrigation delivery water, drainage water, New River, and Alamo River water. Information from two data sets is summarized: (1) “Recent” water quality data, and (2) “Long-term” water quality data. The “Recent” water quality data consists of data obtained during a coordinated monitoring effort at the following locations:

- AAC
- Surface drains that discharge to the Alamo River
  - South Central Drain
  - Holtville Main Drain

TABLE 2.2-1
Long-Term[a] and Recent[b] Mean Flows and Concentrations for Water Quality Parameters in IID's Service Area

	Colorado River Irrigation Delivery in AAC		New River							Alamo River						
	Long-Term[a]	Recent[b]	Long-Term[a]			Recent[b]				Long-Term[a]			Recent[b]			
Parameter	AAC	AAC	Mexico Border	Surface Drains	Outlet to Salton Sea	Border	Greeson	Trifolium 12	Outlet to Salton Sea	Mexico Border	Surface Drains	Outlet to Salton Sea	Border	South Central	Holtville Main	Outlet to Salton Sea
Daily mean flow (cfs)	3,934	—	250	—	622	—	—	—	—	—	—	843	—	—	—	—
Instantaneous flow (cfs)	—	—	193	—	—	—	—	—	—	2	—	—	—	—	—	—
TDS (mg/L)	771	773	3,894	2,116	2,997	2,676	2,033	2,143	2,743	3,191	2,375	2,458	—	2,269	2,347	2,318
TSS (mg/L)	86	11	117	193	313	52	188	189	241	360	318	479	—	329	175	300
Se (µg/L)	2.5	2.12	3.0	7.4	7.1	ND	5.24	6.03	4.09	5.9	7.9	7.7	—	8.77	5.63	7.53
NO3 (mg/L)	0.28	0.4	0.84	7.49	4.37	0.5	4.2	13.0	4.3	1.87	8.14	7.81	—	9.9	8.3	6.4
Total phosphorus (mg/L)	0.05	0.13	1.42	0.78	0.81	2.00	0.77	0.37	1.26	0.47	0.84	0.63	—	0.74	0.61	0.75
Total P in sediment (mg/kg)	—	—	535	1,300	1,600	—	—	—	—	—	—	1,100	—	—	—	—
DDT (µg/L)	0.001	—	0.088	0.013	0.016	—	—	—	—	0.011	0.020	0.016	—	—	—	—
DDT in sediment (µg/kg)	—	—	0.1	2.6	11.0	—	—	—	—	0.1	14.6	0.1	—	—	—	—
DDD (µg/L)	0.001	—	0.046	0.010	0.017	—	—	—	—	0.011	0.017	0.011	—	—	—	—
DDD in sediment (µg/kg)	—	—	—	5.4	—	—	—	—	—	—	6.3	—	—	—	—	—
DDE (µg/L)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
DDE in sediment (µg/kg)	—	—	9.8	44.1	9.8	—	—	—	—	18.0	15.7	30.0	—	—	—	—
Toxaphene (µg/L)	0.001	—	0.272	0.946	0.013	—	—	—	—	0.100	0.995	0.014	—	—	—	—

TABLE 2.2-1
Long-Term[a] and Recent[b] Mean Flows and Concentrations for Water Quality Parameters in IID's Service Area

	Colorado River Irrigation Delivery in AAC		New River							Alamo River						
	Long-Term[a]	Recent[b]	Long-Term[a]			Recent[b]				Long-Term[a]			Recent[b]			
Parameter	**AAC**	**AAC**	**Mexico Border**	**Surface Drains**	**Outlet to Salton Sea**	**Border**	**Greeson**	**Trifolium 12**	**Outlet to Salton Sea**	**Mexico Border**	**Surface Drains**	**Outlet to Salton Sea**	**Border**	**South Central**	**Holtville Main**	**Outlet to Salton Sea**
Toxaphene in sediment (µg/kg)	—	—	10.0	9.5	18.3	—	—	—	—	5.0	26.6	2.5	—	—	—	—
Diazinon (µg/L)	—	—	—	0.025	—	—	—	—	—	—	—	0.025	—	—	—	—
Chlorpyrifos (µg/L)	—	—	—	0.025	—	—	—	—	—	—	—	0.025	—	—	—	—
Dacthal (µg/L)	0.007	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Boron (µg/L)	170	143	1,600	804	1,172	—	456	584	905	1,798	683	695	—	438	609	558

[a] Long-Term data collected from 1970 to 1999 and compiled from various sources (see text for greater explanation).
[b] Recent data collected by the Colorado River Basin Regional Water Quality Control Board from 1996 through 1999.

NOTES
— = Data Not Available
ND = Not Detected
cfs = cubic feet per second
mg/L = milligrams per liter
µg/L = micrograms per liter
µg/kg = micrograms per kilogram

- Surface drains that discharge to the New River
  - Greeson Drain
  - Trifolium 12 Drain
- New River at the International Boundary
- New River at the outlet to the Salton Sea
- Alamo River at the outlet to the Salton Sea

The water quality information contained in this data set was collected and compiled by the Colorado River Basin Regional Water Quality Control Board from 1996 through 1999. The information represents the most current water quality data available. The data were collected from each of the sampling locations listed above during the same time period.

The "long-term" water quality data set includes data collected during numerous monitoring events from sites located throughout the IID service area. This database was compiled for modeling purposes and was obtained from various sources, including the U.S. Environmental Protection Agency's Storage and Retrieval Environmental Data System, U.S. Geological Service's Water Quality Network, Colorado River Basin Regional Water Quality Control Board, and published and unpublished papers and documents. These sources contained water quality data collected within Imperial County over many years. However, for the modeling associated with the water conservation and transfer programs, the data were limited to those collected between 1970 and 1999.

Although the long-term water quality data set contained many samples, the data tended to be collected sporadically in time and at readily accessible sites. Thus, even though the time period for sample collection ranges from 1970 to 1999, the samples were not collected at all sites, nor were they collected on a regular basis. Further, the numbers of analyses for any one constituent ranged from very few to several hundred. Because of the lack of good temporal coverage, the data were grouped by month through the entire study period. The data were then grouped spatially and assigned to distinct geographic locations to quantify the flow and constituent concentrations from each of the various sources that flow into and discharge out of the IID service area. As a result, the data are reported as mean concentrations of the cumulative flows at the following locations:

- IID irrigation delivery water at the AAC
- Alamo River drainage basin
  - Alamo River at the International Boundary
  - IID surface drain discharge to the Alamo River
  - Alamo River at the Salton Sea
- New River drainage basin
  - New River at the International Boundary
  - IID surface drain discharge to the New River
- New River at the Salton Sea

Surface water that is diverted from the Colorado River is the only water available to IID for agricultural use with the exception of rainfall and minor contributions from groundwater sources. The chemical characteristics of the water entering the IID agricultural area change little between the source at the Colorado River and the points where the water enters the delivery systems of the individual fields.

Recent water quality data (1996 to 1999) collected from the AAC shows the following:

- Concentrations for selenium range from 1.94 to 2.42 micrograms per liter (µg/L), and concentrations for boron range from 110 to 190 µg/L. Mean concentrations for selenium and boron are 2.12 and 142.5 µg/L, respectively.
- The concentration of nitrate as nitrogen ranges from non-detectable (at 0.2 milligrams per liter [mg/L]) to 0.40 mg/L. Phosphorous concentrations range from 0.05 to 0.21 mg/L, and the mean concentration of phosphorus is 0.13 mg/L.
- Mean concentrations for selenium and boron during the period 1970 through 1999 are similar to the concentrations shown in the recent data.

Water quality data for total dissolved solids (TDS) show that the annual mean concentration for the period 1970 through 1999 is 771 mg/L. Mean concentrations in the irrigation delivery water were highest during the late 1970s and early 1980s, with concentrations more than 850 mg/L. Starting in 1983, TDS concentrations in the influent decreased to a low of about 525 mg/L in 1986. The major factor contributing to this fluctuation was the unusually high flows carried by the Colorado River during the mid-1980s. Since 1986, TDS concentrations in the irrigation delivery water have gradually increased. Recent data from the 1996 to 1999 period show that TDS concentrations range from 720 to 820 mg/L, and the average concentration for TDS during this period is 772.5 mg/L.

Long-term mean concentrations for the organochlorine insecticides dichloro-diphenyl-tricloroethane (DDT), dichloro-diphenyl-diclhloroethane (DDD), and toxaphene in IID irrigation delivery water are all at or below detection limits of 0.001 µg/L. The long-term mean concentration for organochlorine herbicide Dacthal is 0.007 µg/L.

Drainage Water

Water entering the drainage system primarily comes from three sources: operational discharge, tailwater, and tilewater. Analysis of water discharging to the drainage system indicates the following:

- Operational discharge is considered to have the best water quality because it is not applied to the land and, thus, it should be similar in quality to water entering the IID service area directly from the Colorado River.
- Tailwater is considered the next best in terms of quality. However, tailwater accumulates certain amounts of sediment and solutes (including agricultural chemicals such as fertilizers and pesticides) from the soil as it flows across the cultivated fields.
- Tilewater is generally considered the poorest of the water sources because dissolved salts and other constituents tend to concentrate in the water as it percolates through the root zone and is collected in the subsurface drainage collection system.

Water quality data has been recently (1996 to 1999) collected for four drains in the HCP area: South Central, Holtville Main, Greeson, and Trifolium 12. South Central and Holtville Main drain to the Alamo River while Greeson and Trifolium 12 discharge to the New River. In addition to these drains, sporadic information is available for a few other drains in the HCP area. Water quality of drain water is discussed separately for each drainage basin.

Alamo River Basin

Recent water quality data for South Central and Holtville Main drain show the following.

- Selenium concentrations in the South Central drain at its outlet range from 5.43 to 11.30 µg/L, and the mean concentration is 8.77 µg/L. Selenium concentrations in the Holtville Main drain range from 4.30 to 10.0 µg/L, and the mean concentration is 5.63 µg/L.
- Boron concentrations in the South Central drain range from 260 to 650 µg/L, and the mean concentration is 438 µg/L. Boron concentrations in the Holtville Main drain range from 330 to 740 µg/L, and the mean concentration is 609 µg/L.
- TDS concentrations in the South Central drain range from 1,510 to 3,000 mg/L, and the mean concentration is 2,269 mg/L. TDS concentrations in the Holtville Main drain range from 1,990 to 3,120 mg/L, and the mean concentration is 2,347 mg/L.
- Mean concentrations for total suspended solids (TSS), nitrate as nitrogen, and phosphorous in the South Central drain are 329, 9.9, and 0.7 mg/L, respectively. Mean concentrations of these constituents in the Holtville Main drain are 175, 8.3, and 0.6 mg/L, respectively.

The recent data set for the South Central and Holtville Main drains is useful for comparing water quality trends and values in these drains. However, data from these two drains may not be representative of the entire Alamo River drainage system.

Long-term mean concentrations for selenium, boron, and TDS in surface drains in the Alamo River drainage basin are 7.9 µg/L, 683 µg/L, and 2,375 mg/L, respectively (Table 2.2.1). Long-term mean concentrations for DDT, DDD, and toxaphene in surface drains in the Alamo River drainage basin are 0.02, 0.017, and 0.99 µg/L, respectively.

New River Basin Drains

Based on the recent water quality data set, the range (minimum and maximum) and mean concentration values for selenium, boron, TDS, TSS, nitrate as nitrogen, and phosphorus in the Greeson and Trifolium 12 drains are discussed below.

- Selenium concentrations in the Greeson drain range from 3.58 to 6.76 µg/L, and the mean concentration is 5.24 µg/L. Selenium concentrations in the Trifolium 12 drain range from 3.01 to 15.0 µg/L, and the mean concentration is 6.03 µg/L.
- Boron concentrations in the Greeson drain range from 240 to 680 µg/L, and the mean concentration is 456 µg/L. Boron concentrations in the Trifolium 12 drain range from 250 to 1,000 µg/L, and the mean concentration is 584 µg/L.
- TDS concentrations in the Greeson drain range from 1,490 to 2,840 mg/L, and the mean concentration is 2,033 mg/L. TDS concentrations in the Trifolium 12 drain range from 1,260 to 4,380 mg/L, and the mean concentration is 2,143 mg/L.

- Mean concentrations for TSS, nitrate as nitrogen, and phosphorous in the Greeson drain are 188, 4.2, and 0.8 mg/L, respectively. Mean concentrations of these constituents in the Trifolium 12 drain are 189, 13.0, and 0.4 mg/L, respectively.

The recent data set for the Greeson and Trifolium drains is useful for comparing water quality trends and values in these drains. However, data from these two drains may not be representative of the entire New River drainage system.

Long-term mean concentrations for selenium, boron, and TDS in surface drains in the New River drainage basin are 7.4 µg/L, 804 µg/L, and 2,116 mg/L, respectively. Long-term mean concentrations for DDT, DDD, toxaphene, diazinon, and chloropyrifos in surface drains in the New River drainage basin are 0.013, 0.010, 0.95, 0.025, and 0.025 µg/L, respectively. Concentration values for dichlorophenyl-dichloroethene (DDE) and Dacthal in drain discharge to the New River are unavailable for the long-term period. Overall, the long-term constituent concentration values in the New River drains are similar to the long-term concentration values observed in the Alamo River drains.

Flow at the International Boundary with Mexico is less than 1 percent of the Alamo River's discharge to the Salton Sea. As such, water quality and quantity at the Alamo River outlet are almost totally a function of drainage from IID. Based on the recent water quality data set, the range (minimum and maximum) and mean concentration values for selenium, boron, and TDS at the International Boundary are as follows.

- Selenium concentrations range from 3.0 to 10 µg/L, and the mean concentration is 5.9 µg/L.
- Boron concentrations range from 660 to 3,000 µg/L, and the mean concentration is 1,798 µg/L.
- TDS concentrations range from 1,866 to 4,260 mg/L, and the mean concentration is 3,191 mg/L.

Recent water quality data for the Alamo River at its outlet to Salton Sea show the following.

- Selenium concentrations range from 5.5 to 13.0 µg/L, and the mean concentration is 7.53 µg/L.
- Boron concentrations range from 320 to 800 µg/L, and the mean concentration is 558 µg/L.
- TDS concentrations range from 1,920 to 3,300 mg/L, and mean concentration is 2,318 mg/L.
- Mean concentrations for TSS, nitrate as nitrogen, and phosphorous in the Alamo River at the outlet to the Salton Sea are 300, 6.4, and 0.8 mg/L, respectively.

These concentrations are similar to the concentration values found in drains that discharge to the Alamo River.

Long-term mean concentrations for DDT, DDD, toxaphene, diazinon, and chloropyrifos in the Alamo River at the outlet to the Salton Sea are 0.016, 0.011, 0.014, 0.025, and 0.025 µg/L, respectively.

New River

The New River also enters IID from Mexico, but unlike the Alamo, the New River serves as an open conduit for untreated sewage, heavy metals, and pesticide residues from northern Mexico. Recent water quality data for the New River at the International Boundary show the following.

- Selenium was not detected, and boron was not analyzed in water quality samples collected at the International Boundary.
- TDS concentrations range from 1,970 to 3,480 mg/L, and the mean concentration is 2,676 mg/L.
- Mean concentrations for TSS, nitrate as nitrogen, and phosphorous at the International Boundary are 52.2, 0.5, and 2 mg/L, respectively.

Long-term mean concentrations for selenium, boron, and TDS in the New River at the International Boundary are 3 µg/L, 1,600 µg/L, and 3,894 mg/L, respectively. Long-term mean concentrations for TSS, nitrate as nitrogen, and phosphorous at the International Boundary are similar to the concentrations seen in the recent data. Long-term mean concentrations for DDT, DDD, and toxaphene are 0.088, 0.046, and 0.27 µg/L, respectively.

Recent water quality data (1996 to 1999) for the New River at its outlet with the Salton Sea generally show the following:

- Selenium concentrations range from 2.93 to 11.0 µg/L, and the mean concentration is 4.09 µg/L.
- Boron concentrations range from 530 to 1,200 µg/L, and the mean concentration is 905 µg/L.
- TDS concentrations range from 2,320 to 3,740 mg/L, and mean concentration is 2,743 mg/L.
- Mean concentrations for TSS, nitrate as nitrogen, and phosphorous measured in samples collected from the New River outlet to the Salton Sea are 241 mg/L, 4.3 mg/L, and 1.3 mg/L, respectively.

Long-term mean concentrations for selenium, boron, and TDS in the New River outlet to the Salton Sea are 7.1µg/L, 1,172 µg/L, and 2,997 mg/L, respectively. Long-term mean concentrations for DDT, DDD, and toxaphene are 0.016, 0.017, and 0.013 µg/L.

2.3 Biological Environment

2.3.1 Overview of the Biological Environment

The HCP area lies within the California Desert. Before European settlement, the area consisted of native desert vegetation and associated wildlife. Periodically, the Colorado River changed course and flowed northward into the Salton Trough forming a temporary, inland sea. These former seas persisted as long as water entered from the Colorado River, but evaporated when the river returned to its previous course. Thus, despite the periodic occurrence of a lake within the Salton Trough, the HCP area consisted predominantly of a desert ecosystem.

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The Salton Sea represents the remnants of the most recent occurrence of flooding by the Colorado River when in 1905 the river breached an irrigation control structure and flowed into the Salton Trough. Initially, the surface elevation of the Salton Sea reached –197 feet mean sea level (msl), but evaporation reduced its elevation to –248 msl by 1920 (USFWS 1999a). By this time, agricultural production had increased in both the Imperial and Coachella Valleys and the Salton Sea was receiving drainage water. In 1924 and 1928, presidential orders withdrew all federal lands below –220 msl "for the purpose of creating a reservoir in the Salton Sea for storage of waste and seepage water from irrigated land in Imperial Valley." Since its formation in 1905, the Salton Sea has been sustained by irrigation return flows from the Imperial and Coachella Valleys.

The availability of a reliable water supply effected by construction of Hoover and Imperial Dams and the AAC, allowed the Imperial Valley to be brought into intensive cultivation. To support agricultural production in the valley, an extensive network of canals and drains was constructed to convey water from the Colorado River to farmers in the valley and subsequently to transport drainage water from the farms to the Salton Sea. The importation of water from the Colorado River and subsequent cultivation of the Imperial Valley radically altered the Salton Trough from its native desert condition. The availability of water in the drains and canals supported the development of mesic (marsh-associated) vegetation and in some locations patches of marsh-like habitats (e.g., along the Salton Sea and seepage from canals). These mesic habitats, in addition to the productive agricultural fields, attracted, and currently support numerous species of wildlife that would be absent or present in low numbers in the native desert habitat. Today, small areas of native desert habitat persist in the HCP area, but mainly the HCP area supports habitats created and maintained by water imported to Imperial Valley for agricultural production.

2.3.2 Wildlife Habitat

2.3.2.1 Drain Habitat

Wet area habitats within the HCP area are collectively referred to as "drain habitat." Drain habitat in the HCP area occurs in association with the drainage system, conveyance system, in managed marshes on the state and federal refuges and on private duck clubs, and as unmanaged vegetation adjacent to the Salton Sea.

Drainage System

Currently, IID operates and maintains 1,456 miles (cited from IID Memorandum, dated October 4, 2000) of agricultural drains (Figure 2.3-1). These drains typically are unlined, dirt channels with 65 miles of the drainage network in buried pipes. Main drain channels have an average depth of 8-11 feet with a typical side-slope embankment ratio of 1:1. Lateral ditches have an average depth of 7 feet, with a typical side-slope embankment ratio of 1:1. Some drainage channels are steep-sided with sloughing embankments from years of erosion prior to stabilization; others are sloped more gradually. Water flow in drains is determined by the collective irrigation practices on fields adjacent to the drains. Drains contain flows when irrigation occurs and storms may add to flows in the drains. Peak flows occur during storms and during the months of April and May.

Vegetation in the drains is limited to the embankment slope or sediments directly within the drain channel and typically consists of invasive species such as saltgrass, salt bush, bermuda

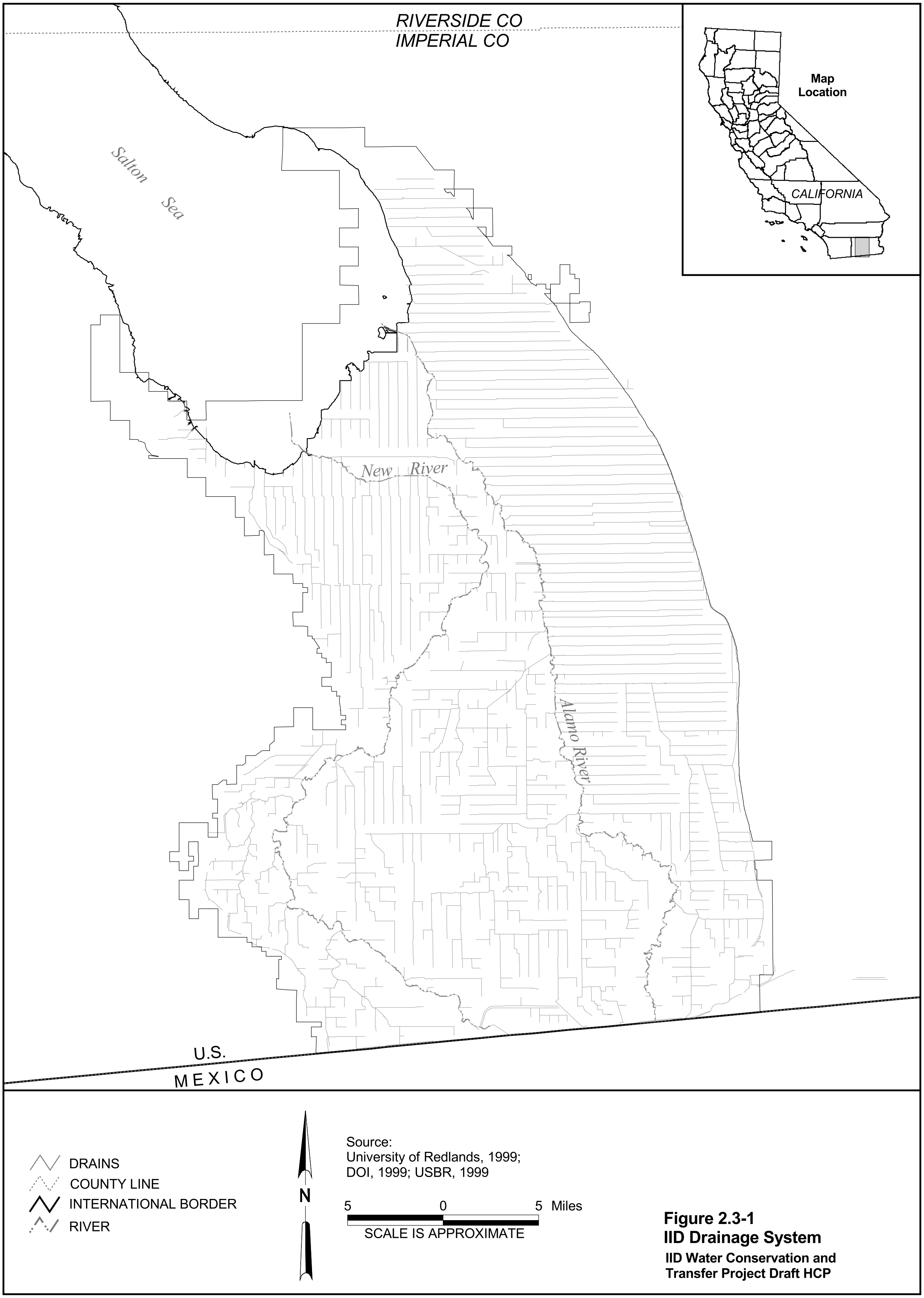

Figure 2.3-1
IID Drainage System
IID Water Conservation and Transfer Project Draft HCP

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grass, common reed, and salt cedar. Vegetation adjacent to the edge of the water typically is restricted to a narrow strip from 3- to 15-feet wide, with more drought-tolerant vegetation on drain embankments. Some drain banks are devoid of vegetation with only a narrow band of saltgrass or bermuda grass adjacent to the edge of the water. Cattail, bulrushes, rushes, and sedges, occur in drain channels, typically in sparse, isolated patches. More extensive stands of cattail/bulrush vegetation may persist where maintenance activities are infrequent. In addition, stands of common reed and cattails can occur at the mouths of drains where they empty into rivers or the Salton Sea. Table 2.3-1 lists typical plant species occurring in irrigation drains in the Imperial Valley.

TABLE 2.3-1
Typical Plant Species Occurring in Drains in Imperial Valley

Adenophyllum porophylloides (false odora)	*Leptochloa uninerva* (Mexican sprangletop)
Allenrolfea occidentalis (iodine bush)	*Malvella leprosa* (alkali mallow)
Aristida oligantha (prairie three awn)	*Paspalum dilatatum* (dallisgrass)
Atriplex sp. (saltbush)	*Phragmites communis* (common reed)
Baccharis emoryi (Emory's baccharis)	*Polygonum aviculare* (prostrate knotweed)
Bassia hyssopifolia (five-hook bassia)	*Polygonum* sp. (knotweed)
Carex sp. (sedge)	*Polygonum* sp. (beard grass)
Chamaesyce melanadenia (prostrate spurge)	*Prosopis* sp. (mesquite)
Croton californicus (croton)	*Psilostrophe cooperi* (paper-daisy)
Cryptantha sp. (popcorn flower)	*Rumex crispus* (curly dock)
Cynodon dactylon (desert tea)	*Salsola tragus* (Russian thistle)
Eriogonum sp. (buckwheat)	*Scirpus* sp. (bulrush)
Heliotropium curassavicum (alkali heliotrope)	*Sesbania exaltata* (Colorado river hemp)
Juncus sp. (rush)	*Suaeda moquinii* (sea-blite)
Lactuca serriola (prickly lettuce)	*Tamarix* sp. (salt cedar)
Larrea tridentata (creosote bush)	*Typha* sp. (cattail)
Leptochloa fascicularis (bearded sprangletop)	

Sources: IID 1994; Reclamation and SSA 2000.

Maintenance activities associated with the drains include ensuring the gravity flow of tilewater into the drains, maintaining conveyance capacity and efficiency, and maintaining structural integrity of the drains. Vegetation is cleared from drains primarily via mechanical means; occasionally vegetation is controlled by prescribed burns or by chemical and biological control methods. Drains are cleaned on an as-needed basis, depending on the extent of sediment and vegetation accumulation. Drains with the lowest gradient accumulate sediment more rapidly and may require cleaning annually. Other drain segments may not require cleaning for periods of 10 years or more. Maintenance activities limit the extent of vegetation supported in the drains.

As part of the development of an EIR for IID's Modified East Lowline and Trifoloium Interceptors, and Completion Projects (IID 1994), drains were surveyed in areas potentially affected by the projects (Figure 2.3-2). In all, about 506 miles of drain were surveyed. For each drain, the general vegetation characteristics were described with particular emphasis

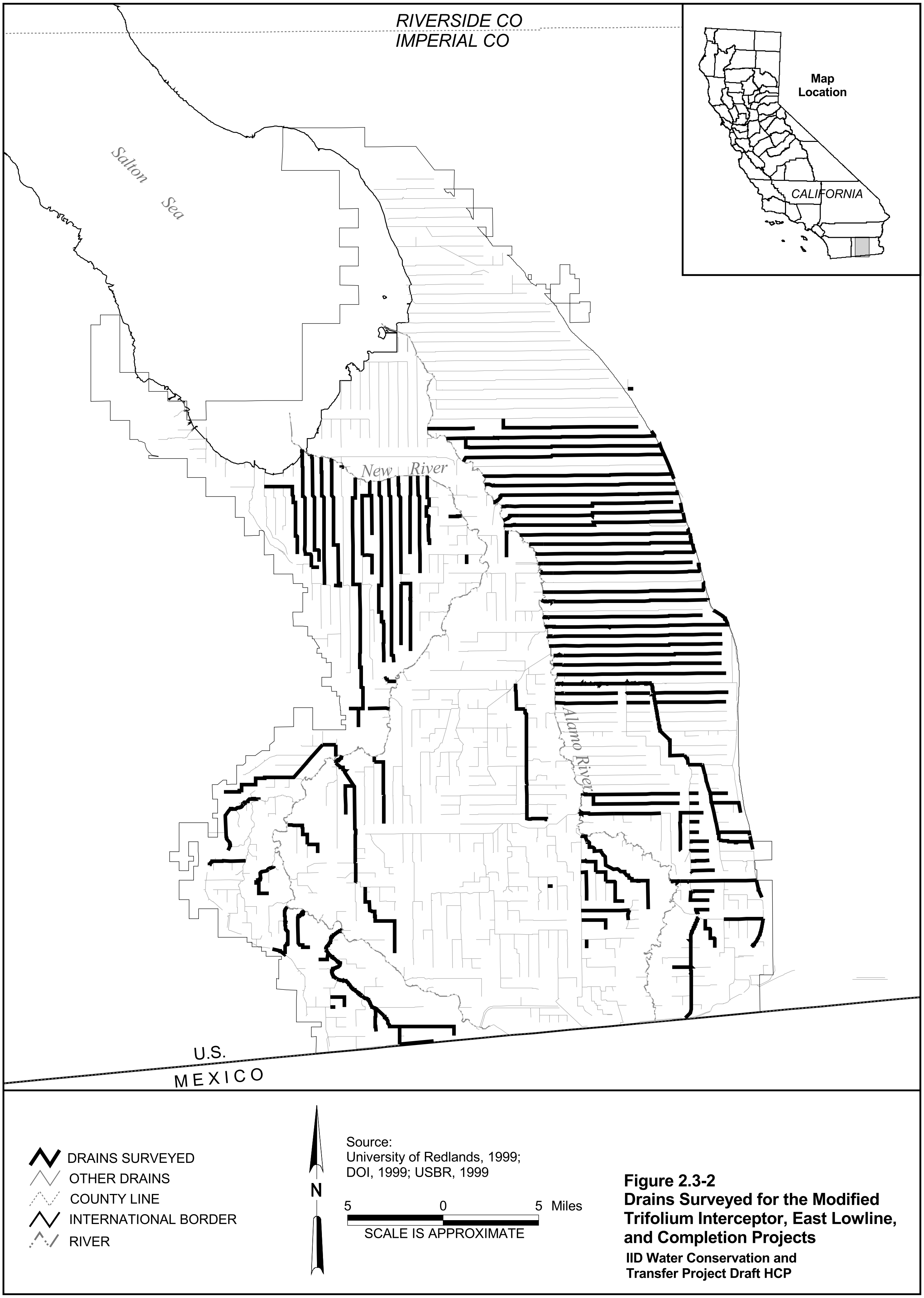

Figure 2.3-2
Drains Surveyed for the Modified Trifolium Interceptor, East Lowline, and Completion Projects
IID Water Conservation and Transfer Project Draft HCP

CH2M Hill RDD ArcView Project File \\rddgis\iid\hcp_drain.apr 7:52 a.m. 03-6-2001 given to patches of cattail or bulrush vegetation. Although no quantitative data were collected, the surveys allow a qualitative assessment of the habitat conditions supported by the drains. Descriptions of the habitat conditions of the drains surveyed for the Lowline and Trifolium Interceptor, and Completion Projects project are provided in Table 2.3-2.

TABLE 2.3-2
Habitat Along Drains in the Imperial Valley

Drain	Habitat Description
Mulberry	The upstream reach of the Mulberry Drain along Rutherford Road is characterized by a narrow, deep channel, lined with rabbits-foot grass, saltgrass, and patches of bulrush. The banks of the drain are largely vegetated along the reach upstream from the drop structure near the Alamo River, although some of the vegetation was killed by herbicide. A drop structure is located about 150 feet upstream from the confluence with the Alamo River. A few scattered salt cedars and salt bushes are found on the banks of the drain channel in a highly disturbed area of mostly barren ground. The drain drops more than 10 feet to the river level. Erosion and bank slumping contribute to the barren banks in this area.
Malva II	The upper parts of the Malva II Drain are very steep-sided and exhibit bank sloughing and little vegetation. Drain bank slopes in the lower reach of the drain west of Park Road are dominated by stands of common reed and bands of bermuda grass or saltgrass. The common reed has been largely killed by herbicide application. A drain channel nears the Alamo River, there are two drop structures with a total drop of about 10 feet upstream from the discharge to the Alamo River. There are several small stands of cattails in the lower reach near the confluence.
Mayflower	The Mayflower Drain has saltgrass as the dominant cover along the steeply cut banks upstream of the first drop structure. Between the drop structure and the Alamo River, the banks of Mayflower Drain have thick stands of common reed and patches of saltgrass. The lower reach of this drain passes through a remnant band of creosote bush scrub before entering a salt cedar stand near the Alamo River. This drain is filled with a dense stand of cattails.
Marigold	The banks of the Marigold Drain are highly disturbed in the lower reach. Debris and grading of the banks have removed most of the vegetation near the Alamo River. Farther upstream are thin banks of saltgrass and dense patches of common reed occur along the banks. The drain passes through agricultural lands or barren ground near the river.
Standard	Upstream from the Alamo River, the Standard Drain forms a narrow channel that parallels the perimeter road of the recently graded basins of the Upper Ramer Lank unit of the State Wildlife Management Area. A 4-foot drop structure is located at the point where the drain passes under the Southern Pacific Railroad tracks. The banks are either barren or have a saltgrass and bermuda grass cover along most of the channel. The banks' slopes are either steeply cut or shallow. Scattered stands of common reed are found on the banks. Further upstream, salt and bermuda grass form the dominant cover along the narrow channel.
Narcissus	Near the State Imperial Wildlife Management Area headquarters, the operational discharge of the Narcissus lateral enters the drain. The banks of this drain are densely vegetated with common reed, saltgrass, and several date and fan palms near the refuge buildings. The Narcissus Drain parallels the access road around the perimeter of Lower Ramer Lake. The drain is mostly a shallow cut, less than 3 feet deep and is adjacent to remnants stands of creosote bush scrub. Near the drain are scattered stands of iodine bush. The lower portion of the drain has a thin strand of curly dock mixed with the saltgrass along the channel. Two drop structures are located near the confluence with the Alamo River. On the Alamo River floodplain, the drain passes through a thick stand of salt cedar that forms the riparian zone.

TABLE 2.3-2
Habitat Along Drains in the Imperial Valley

Drain	Habitat Description
Nettle	Near the confluence with the Alamo River, the banks of the Nettle Drain are generally covered by stands of common reed and saltgrass. The drain cuts deeply to the river, with the upper slopes largely barren and the lower half of the slope covered by salt and bermuda grasses. There are scattered stands of salt bush and common reed along the banks. The lateral operational discharge enters the drain near the railroad tracks.
Nutmeg	A thin stand of saltgrass and scattered stands of common reed are found along most of this drainage channel. The common reed stands have been sprayed with herbicide.
Nectarine	Nectarine Drain is characterized by largely barren bank slopes or patches of salt or bermuda grass for most of its length. Along the lower reach near the Alamo River, the drain has scattered common reed stands and enters the river in a shallow trough. In the Alamo River floodplain, the drain passes through salt cedar thickets, but is largely an open channel.
B Drain	B Drain is lined with stand of common reed and saltgrass along the reach from the proposed interceptor to the junction of B Drain and C Drain. The drain is generally narrow and steeply cut.
C Drain	Vegetation along C Drain is mostly saltgrass and stands of common reed. Some sections appear to be dead from herbicide spray. The extent of the saltgrass on the bank slopes along most of this drain has been controlled by herbicide.
D Drain	The drainage channel has recently been dredged in the section along State Highway 115 (Eddins Road) west of Calipatria. Dredge spoil along the canal embankment contains common reed and saltgrass. The D Drain flows parallel to Highway 115 to the confluence with the Alamo River; west of Brandt Road, D Drain is a pipeline to the Alamo River. The drain passes through a thin stand of salt cedar near the highway bridge.
Spruce No. 4	Spruce No. 4 is characterized by broad and gently sloped banks with patches of bermuda grass. Drain banks are largely devoid of vegetation along the reach upstream from the drop structure near the new River. A drop structure is located about 150 feet upstream from the confluence with the New River in an area of barren cliff banks. The drain drops more than 20 feet to the river level where there are stands of salt cedar forming the New River riparian corridor. Erosion and bank slumping contribute to the barren banks.
Spruce No. 5	Spruce No. 5 is dominated by common reed stands in the lower reach near the New River. Although it is deeply cut near the end of the drain, the upper stream reaches are broad and open and dominated by a salt and bermuda grass cover with a few salt bushes near the top of the slope.
Pinner	Saltgrass is the dominant cover along the banks upstream from the drop structure. Between the drop structure and the New River, the banks of Pinner Drain have debris and rubble piles or are largely barren. No common reed is present, but new stands of salt cedar are becoming established.
Tamarack	A cover of salt and bermuda grasses forms the dominant cover along the bank of this drain near the New River. There are only a few stand of common reed or salt cedar and even fewer salt bush clumps. The channel is only about 3 feet wide along most of the drain.
Timothy	Upstream from the New River, this drain forms a narrow channel. A drop structure is located 200 feet upstream from the confluence. The banks are either barren or have a saltgrass bermuda grass cover along most of the channel. The banks are steep with stands of common reed and some salt bush. Farther upstream, salt and bermuda grasses form a dominant cover on the slope.